**Title of the course:** Guided method-specific research in cognitive psychology 2. (instrumental measurements)

**Course code:** PSYM21-CD-109

**Responsible for the subject:** Nagy Márton

**Academic degree:** PhD

**Position:** Senior lecturer

**MAB Status:** A (T)

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| **Az oktatás célja angolul** |

The aim of the course is to provide an introduction to the experimental methodology of eye tracking and pupillometry or cognitive electrophysiology through the main areas of cognitive research. Students can choose from two topics. The course includes both theoretical and practical parts.

At the beginning of the semester, students will receive a theoretical introduction to the background of eye movement tracking or electrophysiology. As part of the theoretical introduction to the eye tracking course, scientific articles will be processed and presented during the semester. The discussion of scientific articles is led by a discussion student in addition to the lecturer, moderated by the instructor. During the discussion, the focus is on methodological issues.

In the second half of the semester, students will visit a research lab using eye movement tracking or electrophysiology in groups of 4-5 people. In the laboratory, they gain practical experience in the main steps of the research: presentation of stimuli, data acquisition, visualization, data analysis. During the semester, the groups work on their own projects.

**Learning outcomes, competences**

**knowledge:**

• Eye tracking and pupillometry or electrophysiology are the main applications in cognitive research

• knowledge of main methodological issues

• practical experience in eye tracking or electrophysiological research

**attitude:**

• critical approach

• the importance of methodological details

**ability:**

• presentation, discussion and project work in a small group

• eye tracking or electrophysiological laboratory research

• eye tracking or electrophysiological data analysis

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| **Az oktatás tartalma angolul** |

**Main content and thematic units**

• Eye tracking and pupillometry or electrophysiological experimental methodology are detailed topics in the mandatory literature)

• processing and discussing scientific articles (only for the eye movement tracking course)

• practical experience in research

**Planned learning activities, teaching methods:**

• frontal introduction

• student presentations and group project work

• eye tracking or electrophysiology practical demonstration

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| **A számonkérés és értékelés rendszere angolul** |

* Requirements and evaluation method, aspects:

**Requirements and evaluation method:**

* requirements
* class visit
* presentation
* group project work

**grade:**

* average grade of the presentation and the project work

**evaluation criteria:**

• Explain methodological aspects in the presentation

• accurate and detailed methodological presentation of group project work

• contribution of the classes

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| **Idegen nyelven történő indítás esetén az adott idegen nyelvű irodalom:** |

**Compulsory literature for the cognitive electrophysiology course**

Steven Luck (2014): An Introduction to the Event-related Potential Technique.

**Compulsory literature for the eye tracking course (the list may change)**

1. **The relational eye movement effect (REME)**

Hannula, D. E. (2010). Worth a glance: using eye movements to investigate the cognitive neuroscience of memory. Frontiers in Human Neuroscience, <https://doi.org/10.3389/fnhum.2010.00166>

Hannula, D., Ryan, J., Tranel, D., & Cohen, N. (2007). Rapid onset relational memory effects are evident in eye movement behavior, but not in hippocampal amnesia. *Cognitive Neuroscience, Journal of*, *19*(10), 1690–1705.

1. **Recognition memory & pupillometry**

Kafkas, A., & Montaldi, D. (2012). Familiarity and recollection produce distinct eye movement, pupil and medial temporal lobe responses when memory strength is matched. Neuropsychologia, 50(13), 3080–3093. <https://doi.org/10.1016/j.neuropsychologia.2012.08.001>

Kafkas, A., & Montaldi, D. (2015). The pupillary response discriminates between subjective and objective familiarity and novelty: Pupil response to familiarity and novelty. Psychophysiology, 52(10), 1305–1316. <https://doi.org/10.1111/psyp.12471>

Montefinese, M., Vinson, D., & Ambrosini, E. (2018). Recognition memory and featural similarity between concepts: The pupil’s point of view. Biological Psychology, 135, 159–169. <https://doi.org/10.1016/j.biopsycho.2018.04.004>

Otero, S. C., Weekes, B. S., & Hutton, S. B. (2011). Pupil size changes during recognition memory: Pupil size and recognition memory. Psychophysiology, 48(10), 1346–1353. <https://doi.org/10.1111/j.1469-8986.2011.01217.x>

1. **Free and cued recall & pupillometry**

Kucewicz, M. T., Dolezal, J., Kremen, V., Berry, B. M., Miller, L. R., Magee, A. L., Fabian, V., & Worrell, G. A. (2018). Pupil size reflects successful encoding and recall of memory in humans. *Scientific Reports,* 8(1), 4949. <https://doi.org/10.1038/s41598-018-23197-6>

Pajkossy, P., & Racsmány, M. (2019). How the size of the to-be-learned material influences the encoding and later retrieval of associative memories: A pupillometric assessment. *PLOS ONE*, 14(12), e0226684. <https://doi.org/10.1371/journal.pone.0226684>

Pajkossy, P., Szőllősi, Á., & Racsmány, M. (2019). Retrieval practice decreases processing load of recall: Evidence revealed by pupillometry. *International Journal of Psychophysiology*, 143, 88–95. <https://doi.org/10.1016/j.ijpsycho.2019.07.002>

Johansson, R., Pärnamets, P., Bjernestedt, A., & Johansson, M. (2018). Pupil dilation tracks the dynamics of mnemonic interference resolution. *Scientific Reports*, 8(1), 4826. <https://doi.org/10.1038/s41598-018-23297-3>

1. **Non-human primates**

Kano, F., & Call, J. (2014). Great Apes Generate Goal-Based Action Predictions An Eye-Tracking Study. *Psychological Science*, *25*(9), 1691–1698.

Kano, F., & Tomonaga, M. (2009). How chimpanzees look at pictures: a comparative eye-tracking study. *Proceedings of the Royal Society B: Biological Sciences*, *276*(1664), 1949–1955. http://doi.org/10.1098/rspb.2008.1811

Kano, F., & Tomonaga, M. (2013). Head-mounted eye tracking of a chimpanzee under naturalistic conditions. *PloS One*, *8*(3), e59785.

1. **Infants, dogs**

Kaldy, Z., & Blaser, E. (2020). Putting Effort Into Infant Cognition. Current Directions in Psychological Science, 29(2), 180–185. <https://doi.org/10.1177/0963721420903015>

Senju, A., & Csibra, G. (2008). Gaze Following in Human Infants Depends on Communicative Signals. *Current Biology*, *18*(9), 668–671. <http://doi.org/10.1016/j.cub.2008.03.059>

Téglás, E., Gergely, A., Kupán, K., Miklósi, Á., & Topál, J. (2012). Dogs’ Gaze Following Is Tuned to Human Communicative Signals. *Current Biology*, *22*(3), 209–212. <http://doi.org/10.1016/j.cub.2011.12.018>

Cesana-Arlotti, N., Martín, A., Téglás, E., Vorobyova, L., Cetnarski, R., & Bonatti, L. L. (2018). Precursors of logical reasoning in preverbal human infants. *Science*, *359*(6381), 1263–1266. <https://doi.org/10.1126/science.aao3539>

1. **Learning & eye-movements, blinks**

Arató, J., Rothkopf, C. A., & Fiser, J. (2020). Learning in the eyes: Specific changes in gaze patterns track explicit and implicit visual learning [Preprint]. *Animal Behavior and Cognition*. <https://doi.org/10.1101/2020.08.03.234039>

Hoppe, D., Helfmann, S., & Rothkopf, C. A. (2018). Humans quickly learn to blink strategically in response to environmental task demands. *Proceedings of the National Academy of Sciences*, 115(9), 2246–2251. <https://doi.org/10.1073/pnas.1714220115>

Maus, G. W., Duyck, M., Lisi, M., Collins, T., Whitney, D., & Cavanagh, P. (2017). Target Displacements during Eye Blinks Trigger Automatic Recalibration of Gaze Direction. *Current Biology*, 27(3), 445–450. <https://doi.org/10.1016/j.cub.2016.12.029>

1. **Pupillometry in basic cognitive processes / illusions**

Mathôt, S. (2018). Pupillometry: Psychology, Physiology, and Function. *Journal of Cognition,* 1(1).

Laeng, B., & Endestad, T. (2012). Bright illusions reduce the eye’s pupil. *Proceedings of the National Academy of Sciences*, *109*(6), 2162–2167.

Laeng, B., & Sulutvedt, U. (2014). The eye pupil adjusts to imaginary light. *Psychological Science*, *25*(1), 188–197.

Wu, E. X. W., Laeng, B., & Magnussen, S. (2012). Through the eyes of the own-race bias: Eye-tracking and pupillometry during face recognition. *Social Neuroscience*, *7*(2), 202–216. http://doi.org/10.1080/17470919.2011.596946

**Course-specific information (specific to a given lecture or seminar)**

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| **General data** |

**Specific (sub)title of the course (if relevant):**

**Specific (sub)code of the course (if relevant):**

**Date and place of the course:**

**Name of the lecturer:**

**Department of the lecturer:**

**Email of the lecturer:**

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| **Specific syllabus/schedule of the lecture/seminar (if relevant)** |



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| **Further specific information (eg. requirements) (if relevant)** |